Response Action Contract
for Remedial, Enforcement Oversight, and Non-Time
Critical Removal Activities at Sites of Release or
Threatened Release of Hazardous Substances
in EPA Region VIII

U.S. EPA Contract No. 68-W5-0022

EPA Review Draft Technical Memorandum
Contaminant Screening Study
Interim Results
Libby Asbestos Site, Operable Unit 4
Libby, Montana

Work Assignment No.: 116-RIRI-08BC
Document Control No.: 3282-116-RT-OTHR-17346

October 2005

Prepared for:
U.S. Environmental Protection Agency
Region VIII
999 18th Street, Suite 500
Denver, Colorado 80202

Prepared by:
CDM
1331 17th Street, Suite 1100
Denver, Colorado 80202

Contents

Tables

Attachments

Acronyms

CSF	close-support facility
CSS	contaminant screening study
EPA	U.S. Environmental Protection Agency
FS	feasibility study
GIS	geographic information system
IFF	information field form
LA	Libby amphibole
ND	non-detect
NIOSH	National Institute for Occupational Safety and Health
PDI	pre-design inspection
PE	performance evaluation
PLM	polarized light microscopy
RAC	Response Action Contract
RI	remedial investigation
ROD	record of decision
S/cm^2	structures per square centimeter
SAP	sampling and analysis plan
SUA	specific use area
USGS	U.S. Geological Survey
VE	visual area estimation

Section 1
Introduction

This technical memorandum summarizes the existing results of the Contaminant Screening Study (CSS), conducted as part of the Remedial Investigation (RI), at the Libby Asbestos Site. The CSS is a discrete part of the RI intended to collect information about all properties in the Libby OU4 study area. The CSS was initially designed in 2002 and was modified slightly in 2003. Field sampling was completed primarily in 2002 and 2003, but additional properties were screened in 2004 and 2005. Properties will continue to be investigated in the future as necessary.

1.1 Background

Initial U.S. Environmental Protection Agency (EPA) investigations at the Libby Asbestos Site include the Phase I and Phase II sampling programs. The Phase I sampling program, initiated in early 2000, was designed as a rapid pilot-scale investigation to:

- Determine whether airborne asbestos levels in Libby required time-critical action to protect public health
- Quantify asbestos levels in potential source materials
- Identify appropriate analytical methods to screen for and quantify asbestos

The Phase II sampling program began in March 2001 and was designed in part to provide human exposure estimates by collecting air samples during various activities.

Through the Phase I and II programs EPA determined:

- Exposure to Libby amphibole (LA) asbestos is a threat to human health.
- Release of respirable LA occurs when source materials are disturbed.
- Source materials include vermiculite insulation, vermiculite products and process wastes, and contaminated soils.
- Household dust is a potential exposure pathway.
- There is widespread presence of LA throughout the Libby area.

Based upon these conclusions and other considerations, EPA determined it was necessary to conduct emergency response removal actions at the Libby Asbestos Site (EPA 2001, 2002). Initial removal actions focused on larger source areas such as the former screening plant, the former export plant, Plummer Elementary, Libby High School, and Libby Middle School. In 2002, EPA expanded emergency response removal actions to encompass potentially affected residential and commercial properties across the Libby area.

1.2 Objective of the Contaminant Screening Study

The expanding nature of the emergency response cleanup, coupled with the proposed listing of the Site on the National Priorities List, prompted EPA to begin the RI for the Site. Several factors suggested that *all* properties in the area, as opposed to a limited subset, would require some level of investigation. Most importantly, the site conceptual model suggested that the dominant mechanism for contaminant transport was "random" human activity (e.g., use of vermiculite products or wastes). Any property, based upon its past uses, could be affected and none could be excluded based upon geographic location alone. Considering the potential size of the area of concern (approximately 190 square miles), the number of properties to be evaluated (more than 4,000), and the time-sensitive nature of the situation in Libby, development of a cost-effective and timely characterization approach was important. The CSS, as an initial step in the RI, was designed to meet this need.

The general goal of the CSS was to collect information about the presence of potential LA source materials at individual residential and commercial properties. Based upon that information and other criteria [primarily the May 2002 Action Memorandum Amendment (EPA 2002) and the Draft Final Libby Asbestos Site Residential/Commercial Action Level and Clearance Criteria Technical Memorandum (EPA 2003)], EPA sought to classify each property as (1) requiring immediate emergency response cleanup, (2) potentially impacted, but needing additional information to determine if cleanup is necessary, and (3) likely not impacted or requiring cleanup.

1.3 Continuing Remedial Investigation Activities

EPA has used the results of the CSS to determine which properties require emergency response cleanup, as well as to investigate the nature and extent of contamination across the Site. Concurrent with the CSS and emergency response cleanup, EPA also began and continues several other RI-related activities. These include, but are not limited to, (1) the Performance Evaluation (PE) Study, intended to assess and develop analytical methods for detection and quantification of LA in soil, (2) development of screening level risk estimates, (3) review and analysis of data trends seen in Libby, (4) review and analysis of asbestos related data, information, and science outside of Libby, (5) collection of indoor dust samples as specified above, (6) planning and design of animal inhalation study, intended to investigate potential non-cancer effects of LA, (7) development and refinement of the Libby 2 database and associated geographic information system (GIS) applications, and (8) collection of other additional information necessary for the RI and/or feasibility study (FS).

Section 2
Contaminant Screening Study Approach

The CSS used a combination of property reconnaissance (i.e., visual inspections and verbal interviews) and soil sampling to screen properties for the presence of potential sources of LA. Potential sources include vermiculite products and wastes, vermiculite-containing building materials, and contaminated soils. Inspection and sampling efforts focused on areas of the property where vermiculite products or wastes were most likely to be encountered (e.g., attic insulation and garden soil) and where the potential disturbance and exposure to LA was most likely (e.g., near-surface soils). For some properties, follow up indoor dust sampling was conducted and is discussed below.

Property reconnaissance and sampling followed the procedures outlined in the CSS SAP (CDM 2002a). Minor deviation from or changes to the rationale and approach described in the CSS SAP have been documented in RI SAP (CDM 2003c).

There were also several "unique" properties sampled as part of the CSS that required a site-specific sampling protocol that supplemented the original SAP. These were generally large or complex properties. SAP Addendums were generated for each unique property and data collection was performed or is scheduled to be perform according to the processes outlined in each document. These unique properties include:

- J Neils Park and State Highway 37 (2003d);
- Cemetery Park Ball Fields (2002b);
- The former Stimson Lumber Mill (2002c);
- The dirt alleys within the City of Libby (2003f);
- Libby Drive In Theater (2002d);
- A former concrete plant located on Highway 2 (2003g);
- A former landfill (2003h);
- The public compost pile at the Lincoln County Landfill (2004c);
- Riverside Park (2003e);
- Cabinet View Country Club (2004b); and
- The Johnston Acres area of Libby (2005).

Individual results memorandums were prepared for each of these unique properties where samples were collected.

2.1 Property Reconnaissance

Property reconnaissance provided for visual identification of sources of LA and systematic dialog with residents and property owners to obtain historical or anecdotal information about the property. The reconnaissance teams contacted residents, obtained signed property access agreements (Attachment A), assigned property identification data for use with GIS, photographed building(s) located on each property, inspected the property, and completed the information field forms (IFFs) (Attachment B). Property owner interviews and visual inspections were used to collect historical property information and to obtain answers to seven specific questions:

- Is there any knowledge of former miners, close relatives of miners, or any highly exposed persons living at or visiting the property?
- Is the resident, past or present, diagnosed with an asbestos-related disease?
- Does the interior have vermiculite insulation?
- Has the interior ever had vermiculite insulation?
- Are there vermiculite additives in any of the building materials?
- Are source materials present at the property?
- Where are possible outdoor LA sources located?

Following completion of the IFF, soil sample teams returned to the property and collected soil and/or dust samples.

2.2 Soil Sampling

Many of the properties in Libby were suspected to contain vermiculite products or vermiculite-related wastes as fill or soil conditioners. Therefore, samples of outdoor soils were collected at all properties to determine if LA was present and, if so, at what concentration.

For several reasons, during design of the CSS, EPA assumed that visible vermiculite in soil was an indicator of the presence of LA (CSS SAP, Appendix A, CDM 2002a) and, if present, would be cleaned up. As such, soil samples were initially collected only from areas where vermiculite was *not* observed. This approach was followed throughout the 2002 field-sampling season. Prior to the 2003 field season, the CSS soil sampling approach was modified. Areas of a property were further segregated into "specific use areas" (SUAs). SUAs were defined as areas such as gardens, landscaped areas, and play areas that lacked grass cover that could receive intense or frequent use. During and after 2003, *only* SUAs were not sampled if vermiculite was observed. All other areas were sampled regardless of the presence of vermiculite. This approach remains in effect.

In general, two to five, 5-point composite samples were collected from each property. For non-disturbed areas (e.g., yard), composite samples were collected from a 0 to 1 inch depth interval. For disturbed areas (e.g., SUAs), composite samples were collected from a 0 to 6 inch depth interval. These depths were chosen based on the site conceptual model. Frequent mechanical disturbances that could result in release and exposure to LA are most likely to occur at the surface for non-disturbed areas (e.g., lawn mowing). However, frequent disturbances are likely to occur at deeper depths in SUAs (e.g., rototilling and digging).

2.3 Dust Sampling

Interim results from the CSS were used to determine which properties warranted follow up indoor dust sampling. If a property contained either an identified source of LA (e.g., vermiculite insulation, visible vermiculite outdoors) or a history that suggested potential dust contamination (e.g., a former vermiculite worker lived in the home), it was earmarked for indoor dust sampling. Indoor dust sampling was not specifically a part of the CSS program, but was part of the general RI sampling. Details regarding indoor dust sampling can be found in the RI SAP (CDM 2003c) and other associated documents. For purposes of this report, dust results are presented in units of LA structures per square centimeter (S/cm^2).

2.4 Development of Soil Analytical Methods

At the onset of the CSS, EPA recognized that existing analytical methods for detecting and measuring asbestos in soil were inadequate, especially for detection of LA at levels less than 1%. Because exposure to contaminated soils was thought to be a significant exposure pathway, and because outdoor soils could serve as an ongoing source of contamination to indoor dust, the lack of a proven analytical method presented a serious challenge.

To address this issue, EPA designed and implemented a PE Study. The objectives of the PE Study were:

- Develop PE samples of known, verified concentrations that could be used to test the efficacy of soil analytical methods.
- Using the PE samples, evaluate multiple analytical methods and technologies to determine their suitability for detecting and measuring LA in soil at various concentrations.
- Based upon these results, develop and refine site-specific methods for detecting LA in soil.
- Use PE samples as a quality control tool for testing the performance of analytical laboratories.

The PE Study was conducted in several phases. Much of the work was conducted in 2002. While the PE Study was being conducted, soil samples collected as part of the

CSS were initially held without analysis. During 2003, based upon the interim results of the PE Study, EPA began analysis of CSS soil samples using a multi-step, site-specific polarized light microscopy (PLM) analytical method called PLM-Visual Area Estimation (PLM-VE) [Syracuse Research Corporation (SRC) 2003]. The details of the PE Study are currently being summarized in the upcoming PE Study Results Report.

2.5 Soil Sample Preparation and Analysis

During analytical method development, it was determined that sample preparations (i.e., drying, sieving, and grinding) increased the ability to observe LA in soils samples at concentrations less than 1%. Therefore, prior to analysis, soil samples are prepared at CDM's close-support facility (CSF) in Denver in accordance with the CSF soil preparation plan (CDM 2003a) or CSF soil preparation plan revision 1 (CDM 2004a), depending on date of processing. During sample preparation, the soil is sieved to remove all material greater than ¼-inch that is unsuitable for grinding and is less likely to contribute to contain LA (coarse fraction). The remaining fine fraction is mixed and mechanically ground to a size of approximately 250 microns in diameter. The coarse fraction is analyzed using a PLM gravimetric analysis entitled PLM-Gravimetric (SRC 2003) and the fine fraction is analyzed using PLM-VE.

For the fine fraction, PLM-VE results are reported in a multi-bin system:

Bin A:	No LA detected. Bin A results are generally shown as "ND" for non-detect.
Bin B1:	LA detected, but at a level that cannot be quantified (<0.2%). Bin B1 results are generally shown as "Trace."
Bin B2:	LA detected at a concentration less than 1% but greater than or equal to approximately 0.2%. Bin B2 results are generally shown as "<1%."
Bin C:	LA detected at a concentration greater than or equal to 1%. Bin C results are generally shown as "1%," "2%," etc.

For the coarse fraction, PLM-Gravimetric analysis is used to determine if any of the larger sieved materials are LA related-materials, but the analytical results of PLM-Gravimetric do not correlate to the same resulting bin system of the PLM-VE method.

EPA is in the process of evaluating the accuracy and precision of each of these methods. However, based on EPA's PE study to date, PLM-VE results are currently being used to make project remediation decisions. For the purposes of this report, only PLM-VE results are presented.

In addition to analysis of CSS samples, all Phase I soil samples with non-detect results that were previously analyzed using National Institute for Occupational Safety and Health (NIOSH) 9002 (NIOSH 1994) were also processed at the CSF and sent for

reanalysis using PLM-VE. Any Phase I samples with detectable levels of LA were not reanalyzed.

Section 3
Contaminant Screening Study Results

In order to maximize resources and move forward with emergency response cleanup, EPA has continually reevaluated CSS data as the cleanup and investigation has progressed. For instance, in 2002 and 2003, before the PE study was conducted and most CSS soil samples were analyzed, EPA primarily used visual inspection and Phase I results to help determine which properties required soil cleanup. Later, as the sampling approach evolved, cleanup decisions were based upon a combination of visual inspection results (e.g., for SUAs) and PLM-VE sample results.

Overall, this means that the number of properties in each of the three planning categories discussed in Section 1.2 (require immediate cleanup, need more information, cleanup not likely) has fluctuated over time as more information became available. The results presented below reflect totals as of July 31, 2005 and are based upon emergency response criteria established in the Action Level Clearance Criteria Technical Memorandum (EPA 2003). It is very important to note that the numbers below are presented *only* for planning purposes during the emergency response and the RI/FS phases and are *not* intended to portray the ultimate number of properties requiring cleanup or remedial action.

3.1 Current Emergency Response Removal Action Decision Criteria

Each property in the Libby study area may require cleanup in three general areas: the attic space, the interior living space, and outdoors. Therefore, three decisions are required for each property to determine the need for, and extent of, cleanup. The CSS was designed to collect information for each of these three areas.

Table 3-1 outlines the current residential/commercial emergency response decision criteria for each area (EPA 2002). The criteria were established in the Draft Final Libby Asbestos Site Residential/Commercial Action Level and Clearance Criteria Technical Memorandum (EPA 2003). For each area, a property has to meet only *one* of the triggering criteria (as opposed to all) for that area to require cleanup. Again, it is important to note that cleanup criteria and action levels are subject to change and have been continually evaluated throughout the entire process. Final action levels, and the total number of properties requiring cleanup, will be available after the RI/FS is completed and a Record of Decision (ROD) is published.

Table 3-1 Summary Decision Matrix from Action Level and Clearance Criteria Technical Memorandum (EPA 2003)

Cleanup Decision	Location	Action Level Trigger
Emergency Response Removal Action	Indoor	
	Attic/Walls	■ Visual confirmation of open, non-contained, or migrating vermiculite insulation
	Living Space	■ Visual confirmation of vermiculite in the indoor living space ■ Dust sample with LA concentration greater than or equal to 5,000 S/cm^2
	Outdoor	
	SUAs	■ Visual confirmation of visible vermiculite or other vermiculite-related waste products OR soil sample results greater than or equal to 1% LA (Bin C) by PLM-VE
	Other Soil Areas	■ Soil sample result with greater than or equal to 1% LA (Bin C) by PLM-VE
No Current Action	All locations	■ None of the above conditions are present at the property

3.2 Number of Properties and Samples

As of July 31, 2005, 4,019 properties have been visited as part of the CSS. Investigations were conducted at 3,662 properties and 15,312 soil samples were collected as a part of this investigation. To date, all of the soil samples collected have been processed at the CSF and the majority have been analyzed using PLM-VE, including all Phase I soil samples with "ND" results. Dust sampling did not begin until 2003 and the majority of the samples are still pending analysis. Dust samples that have been collected and analyzed during pre-design inspections and RI sampling are included in the presentation of results in Section 3.3. A summary of soil and dust samples and analyses by year is presented in Table 3-2.

Table 3-2 Comparison of Soil and Dust Samples Collected and Analyzed Per Year

	Soil sample Collected	Soil Samples analyzed	Dust samples collected	Dust samples analyzed
2002	10,449	10,372	1	1
2003	3,319	3,282	3,102	1,126
2004	1,229	1,223	63	63
2005	315	267	44	32

3.3 General Results

Based on the planning categories in the CSS SAP Revision 1 (CDM 2003b) and the criteria outlined in Table 3-1 above:

- **1,609** properties were categorized as *require immediate cleanup* (i.e., exhibited at least one current emergency response action level trigger) in an indoor or outdoor location of concern.

- **793** properties were categorized as *additional information required* (i.e., conditions suggest potential contamination, but meet no emergency response action levels).

- **1,260** were categorized as *cleanup not likely required* (i.e., no emergency response triggers or other conditions suggesting contamination were observed or detected).

- **357** properties were not inspected or sampled due to denials of access or other factors.

Detailed results for the 3,662 properties inspected and sampled are presented in Table 3-3. Note that the quantities in the last (Condition or Action Level) column are not mutually exclusive and do not add up to those the category totals in the first (Planning Category) column. This is because (1) any property may have one or several of the conditions or action levels presented and (2) each property is only placed in one category. For instance, a large number of properties with vermiculite present in the yard *also* have soil sample results of trace or <1% (Bins B1 and B2). Similarly, many of the properties in the immediate cleanup required category meet several of the action levels currently required to trigger emergency response cleanup.

Again, it is important to note that the quantities in Table 3-3 are based upon current emergency response criteria and available data. The numbers will change as additional dust samples are analyzed and may significantly change upon publication of a ROD. The results are presented for planning purposes only.

Table 3-3 Detailed CSS Results

Planning Category	Area	Condition or Action Level
Cleanup Required (1609 properties)	Attic/walls	• Visual confirmation of open, non-contained, or migrating vermiculite insulation ***(621 properties)***
	Indoor living space	• Visual confirmation of vermiculite in the indoor living space ***(150 properties)***
		• Dust sample results with a concentration greater than or equal to 5,000 LA S/cm^2 ***(72 properties)***
	SUAs	• Visual confirmation of vermiculite or other vermiculite mine related materials or soil sample results with a concentration greater than or equal to 1% LA (Bin C) by PLM-VE ***(1181 properties)***
	Other soil areas	• Soil sample results with a concentration greater than or equal to 1% LA (Bin C) by PLM-VE **(60 properties)**
Remediation Pending Additional Information (793 properties)	Indoor living space	• Current or past resident employed at Libby vermiculite mine or other Libby processing facilities ***(796 properties)***
		• Current or past resident diagnosed with an asbestos-related disease ***(693 properties)***
		• Building materials containing vermiculite are deteriorating ***(92 properties)***
	Attics/walls	• Observation that vermiculite insulation has been previously removed but dust samples were not previously collected ***(11 properties)***
		• Presence of vermiculite insulation in attic possible but not confirmed ***(125 properties)***
	SUAs and other soil areas	• Vermiculite visible over large area of property ***(756 properties)*** • Soil sample results with a concentration less than 1% (Bin B1 or B2) by PLM-VE ***(756 properties)*** • PLM-Gravimetric results indicated potential large particle LA ***(12 properties)***
Remediation Not Likely Required (1260 properties)	Entire Property	• Vermiculite insulation not present in attic • Vermiculite insulation not present in attic in past • Any available dust results are less than 5,000 LA S/cm^2 • No visible vermiculite in specific use areas • All soil sample results are ND (Bin A) • No vermiculite mining or processing history at property • No asbestos-related disease history • Vermiculite not used in building materials

3.4 Properties Remediated as of July 31, 2005

As discussed earlier, there were 1,609 properties in Libby identified as requiring remediation. As of July 31, 2005 there have been 448 individual properties remediated (173 interior, 156 exterior, and 113 combination). The remaining six properties have been classified as demolitions. The initially identified status of a property (i.e., interior, exterior, combination) is reevaluated during the pre-design inspection (PDI) and periodically recharacterized with the newly acquired information. Based on field observations, the frequency of this divergence in property status from the CSS to the PDI is less than 10%.

Section 4
References

CDM. 2002a. Final Sampling and Analysis Plan, Remedial Investigation, Contaminant Screening Study, Libby Asbestos Site, Operable Unit 4. April.

_____. 2002b. Final Sampling and Analysis Plan Addendum for the Cemetery Park Ball Fields. July.

_____. 2002c. Draft Sampling and Analysis Plan Addendum for the Stimson Lumber Company Area. August.

_____. 2002d. Final Sampling and Analysis Plan Addendum for the Libby Drive In Theater. September.

_____. 2003a. Close Support Facility, Soil Preparation Plan, Libby, Montana Asbestos Project, Sample Processing. April.

_____. 2003b. Final Sampling and Analysis Plan, Remedial Investigation, Contaminant Screening Study, Revision 1. April.

_____. 2003c. Final Sampling and Analysis Plan, Remedial Investigation, Libby Asbestos Site, Operable Unit 4. May.

_____. 2003d. Final Sampling and Analysis Plan Addendum for J. Neils Park and State Highway 37. July.

_____. 2003e. Final Remedial Investigation and Removal Action Work Plan for Riverside Park. September.

_____. 2003f. Final Sampling and Analysis Plan Addendum for the City of Libby Alley Investigation. October.

_____. 2003g. Final Sampling and Analysis Plan Addendum for the Former Concrete Plant Investigation. October.

_____. 2003h. Final Sampling and Analysis Plan Addendum for the Former Landfill Site Investigation. October 2.

_____. 2003i. Final Draft Pre-Design Inspection Activities Work Plan. November.

_____. 2004a. Close Support Facility, Soil Preparation Plan (Revision No. 1), Libby, Montana Asbestos Project, Sample Processing. March.

_____. 2004b. Final Sampling and Analysis Plan Addendum for the Cabinet View Country Club. August.

_____. 2004c. Compost Stockpile Area Sampling Memorandum. September 16.

_____. 2005. Johnston Acres Field Investigation Memorandum. January 7.

EPA. 2001. Chris Weis Memorandum to Paul Peronard. Subject: Amphibole Mineral Fibers in Source Materials in Residential and Commercial Areas of Libby Pose an Imminent and Substantial Endangerment to Public Health. December 20.

_____. 2002. Action Memorandum Amendment for the Time-Critical Removal Action at the Libby Asbestos Site - Libby, Lincoln County, Montana. May.

_____. 2003. Draft Final Libby Asbestos Site Residential/Commercial Cleanup Action Level and Clearance Criteria Technical Memorandum. December.

NIOSH. 1994. Asbestos (bulk) by PLM. Method 9002, Issue 2. August.

SRC. 2003. Analysis of Asbestos Fibers in Soil by Polarized Light Microscopy. SRC-LIBBY-03 (Rev. 0). March 3, 2003.

Attachment A
Property Access Agreement

Attachment B
Information Field Form